

In the Claims

This listing of claims will replace all prior versions and listings of claims in the application:

1 1. (Previously presented) An apparatus for measuring speaker
2 cone displacement relative to a fixed position in an audio speaker
3 having a voice coil aligned with the speaker cone along a central
4 axis, the apparatus comprising:

5 (a) a variable reluctance sensor device; said sensor device
6 including a first unit fixed relative to said fixed position; and a
7 second unit affixed to said speaker cone effecting relative motion
8 between said first unit and said second unit through motion of said
9 speaker cone at a position on said cone, said first unit and said
10 second unit disposed coaxially about an axis radially offset from
11 said central axis;

12 (b) a signal injecting circuit coupled for injecting a
13 predetermined input signal into one of said first and second units;
14 and

15 (c) a signal receiving circuit coupled with said one of said
16 first and second units for receiving a signal resulting from
17 modulation of said input signal due to variation of reluctance of
18 said sensor device caused by displacement of said first unit
19 relative to said second unit, and for generating an indicating
20 signal based upon said resulting signal; at least one signal
21 characteristic of said indicating signal being related with said
22 cone displacement.

1 2. (Previously Presented) The apparatus of Claim 1, wherein
2 said first unit comprises a core structure; and wherein said second
3 unit comprises a electromagnetic coil structure.

1 3. (Previously Presented) The apparatus of Claim 1 wherein

2 said second unit is affixed to said speaker cone at a substantially
3 stationary node of any modal vibration of said speaker cone.

1 4. (Previously Presented) The apparatus of Claim 3, wherein
2 said second unit is mounted on said cone using a wedge.

5 to 6. (Cancelled)

1 7. (Previously Presented) The apparatus of Claim 1, wherein
2 said first unit comprises an electromagnetic coil structure; and
3 wherein said second unit comprises a core structure.

1 8. (Previously Presented) An apparatus for measuring speaker
2 cone displacement relative to a fixed position in an audio speaker
3 having a voice coil aligned with the speaker cone along an axis,
4 the apparatus comprising:

5 (a) a variable reluctance sensor device; said sensor device
6 including a magnetic coil structure fixed relative to said fixed
7 position; and a core structure affixed to said speaker cone
8 effecting relative motion between said first unit and said second
9 movement through motion of said speaker cone at a position on said
10 cone radially offset from said axis; wherein said electromagnetic
11 coil structure operates as at least part of a high pass filter
12 having a corner frequency;

13 (b) a signal injecting circuit coupled for injecting a
14 predetermined input signal into one of said first and second units;
15 said predetermined input signal has a frequency substantially below
16 said corner frequency; and

17 (c) a signal receiving circuit coupled with said one of said
18 first and second units for receiving a signal resulting from
19 modulation of said input signal due to variation of reluctance of
20 said sensor device caused by displacement of said first unit

21 relative to said second unit, and for generating an indicating
22 signal based upon said resulting signal; at least one signal
23 characteristic of said indicating signal being related with said
24 cone displacement.

9 to 20. (Cancelled)

1 21. (Previously Presented) An apparatus for measuring speaker
2 cone displacement relative to a fixed position in an audio speaker
3 having a voice coil aligned with the speaker cone along an axis,
4 the apparatus comprising:

5 (a) a variable reluctance sensor device; said sensor device
6 including a core structure fixed relative to said fixed position;
7 and a magnetic coil structure affixed to said speaker cone
8 effecting relative motion between said first unit and said second
9 movement through motion of said speaker cone at a position on said
10 cone radially offset from said axis; wherein said electromagnetic
11 coil structure operates as at least part of a high pass filter
12 having a corner frequency;

13 (b) a signal injecting circuit coupled for injecting a
14 predetermined input signal into one of said first and second units;
15 said predetermined input signal has a frequency substantially below
16 said corner frequency; and

17 (c) a signal receiving circuit coupled with said one of said
18 first and second units for receiving a signal resulting from
19 modulation of said input signal due to variation of reluctance of
20 said sensor device caused by displacement of said first unit
21 relative to said second unit, and for generating an indicating
22 signal based upon said resulting signal; at least one signal
23 characteristic of said indicating signal being related with said
24 cone displacement.